PULSE LAB.

VENNER

ELECTRONICS LTD.

Transistorized Digital
Printer type TSA65.
Instructions.

Note

Lubrication: Reference should be made to the Hewlett Packard Instruction Manual for details regarding the regular lubrication of the TSA65 Printer Mechanism. (See section IV 4.5.).

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CONTENTS.

	Page No.
1. Introduction:	1.
2. Technical Summary:	1.
2.1. Power Supply.	1.
2.2. Output.	1.
2.3. Ambient Temperature Range.	1.
2.4. Dimensions and Weight.	1.
3. Description of Equipment:	2.
3.1. Equipment List.	2.
3.2. Mechanical Description.	2.
3.3. Circuit Description.	5.
3.3.1. Power Supply.	5.
3.3.2. Backing-off voltage.	9.
3.3.3. Printer.	9.
3.3.4. Command to Print.	10.
3.3.5. Input impedance of Command to Print.	11.
3.3.6. Multi-line Comparators in Use.	12.
3.3.7. Multi-line Comparators NOT in Use.	13.
3.3.8. Hold Signal.	13.
3.3.9. Input Impedance of Information Lines.	14.
4. Installation Procedure.	14.
4.1. Connexions.	14.
4.1.1. TS39 Sockets.	15.
4.1.2. Wheels (Numbers)	15.
4.1.3. Digits not required on any used wheels.	16.
4.1.4. Unused Wheels.	16.
4.2. Input Resistors.	16.
4,3. Command and Hold.	17.
4.3.1. The Print Command Signal.	17.
4.3.2. The Hold Signal.	17.
4.4. H.T. and Backing-off Voltage.	17.
4.4.1. H.T. Adjustment.	17.
4.4.2. Backing-off Voltage adjustment.	17.
4.5. Paper Advance and Space Selector.	18.
4.5.1. Paper Advance.	18.
4.5.2. Space Selector.	18.
4.6. Record.	18.
4.6.1. Record On.	18.
4.6.2. Manual Record.	18.
Precautionary Notes.	19.

CONTENTS.

Page No.

1. Introduction 1.

2. Technical Summary 1.

2.1. Power supply. 1.
2.2. Output. 1.
2.3. Ambient Temperature Range. 1.
2.4. Dimensions and Weight. 1.

3. Description of Equipment 2.

3.1. Equipment Unit. 2.
3.2. Mechanical Description. 2.
3.3. Circuit Description. 2.
3.3.1. Power Supply. 2.
3.3.2. Heating-coil voltage. 3.
3.3.3. Printer. 3.
3.3.4. Command to Print. 10.
3.3.5. Input impedance of Command to Print. 11.
3.3.6. Multi-line Computers in Use. 12.
3.3.7. Multi-line Computers NOT in Use. 12.
3.3.8. Hold Signal. 13.
3.3.9. Input Impedance of Information Lines. 14.

4. Installation Procedure. 14.
4.1. Connections. 14.
4.1.1. 1839 Modem. 15.
4.1.2. Modem (Bandera) 15.
4.1.3. Lights not required on any used circuits. 16.
4.1.4. Unused Circuits. 16.
4.2. Input Resistors. 16.
4.3. Command and Hold. 17.
4.3.1. The Print Command Signal. 17.
4.3.2. The Hold Signal. 17.
4.4. M.T. and Heating-coil Voltage. 17.
4.4.1. M.T. Adjustment. 17.
4.4.2. Heating-coil Voltage adjustment. 17.
4.5. Paper Advance and Space Selector. 18.
4.5.1. Paper Advance. 18.
4.5.2. Space Selector. 18.
4.6. Preparation. 18.
4.6.1. Ribbon On. 18.
4.6.2. Manual Reset. 18.
Precautionary Notes. 19.

CONTENTS (continued).

	Page No.
Figure 1.	
Connexions.	20.
Circuit Reference (Diagram ES32/88)	27.
Circuit Reference (Diagram ES32/89)	27.

ILLUSTRATIONS.

Circuit Diagram for Printer type TSA65.	ES32/88.
Circuit Diagram for Pre-wired 10-line type Printer Mechanism type TSA65.	ES32/89.
Internal Connexions of Main Signal Lines for Printer type TSA65.	ES32/90.

CONTENTS (continued).

Page No.

Figure 1.

Connexions. 20.

Circuit Reference (Diagram WB32/88) 27.

Circuit Reference (Diagram WB32/89) 27.

ILLUSTRATIONS.

Circuit Diagram for Printer type TSA65. WB32/88.

Circuit Diagram for Pre-wired 10-Line type WB32/89.
Printer Mechanism type TSA65.

Internal Connexions of Main Signal Lines
for Printer type TSA65. WB32/90.

Transistorized Digital Printer, type TSA65.

Preface.

Three 50-pin connectors (No's 1,2 & 3) are fitted on the rear panel of the instrument.

On TSA65 units bearing serial numbers less than G 688, 'McMurdo' plugs were used for these connectors; on units of serial number G688 onwards, 'Amphenol' sockets are fitted.

Where terminations at the above connectors (1,2 & 3) are referred to in the following text, the pin number of the 'Amphenol' type socket is quoted first followed by the equivalent pin-connexion for the McMurdo plug, in brackets.

A full list of connexions is given on pages 20-25 Two columns of connexions are provided, one column for each type of connector.

Similarly, on the circuit diagrams where terminations at connectors 1,2 & 3 are indicated, the pin references for the 'Amphenol' and 'McMurdo' type connectors are quoted. It may assist the reader to note that pin references for 'Amphenol'sockets consist of numbers only, whilst those for 'McMurdo' plugs are prefixed by a letter. Thus, pins 2,11,45 refer to 'Amphenol' socket connexions and pins A2, B1, C13, to 'McMurdo' plug connexions.

Note: In the following text the abbreviation f.p.c. will be used for 'fifty-pin connector' and may be read as referring to an 'Amphenol' socket or 'McMurdo' plug as the case may be. Hence f.p.c 1 refers to the 50-pin connector No.1; etc.

Transistorised Digital Printer, type TDP/5.

Preface.

Three 50-pin connectors (J's 1, 2 & 3) are fitted on the rear panel of the instrument.

On TDP/5 units bearing serial numbers less than 0 683, 'Mombo' plugs were used for these connectors; on units of serial number 0683 onwards, 'Ampheno' sockets are fitted.

There terminations at the above connectors (J's 1, 2 & 3) are referred to in the following text, the pin number of the 'Ampheno' type socket is quoted first followed by the equivalent pin-connexion for the 'Mombo' plug, in brackets.

A full list of connexions is given on page 20-3. Two columns of connexions are provided, one column for each type of connector.

Similarly, on the circuit diagrams where terminations at connectors J's 1, 2 & 3 are indicated, the pin reference for the 'Ampheno' and 'Mombo' type connectors are quoted. It may assist the reader to note that pin reference for 'Ampheno' sockets consist of numbers only, whilst those for 'Mombo' plugs are prefixed by a letter, thus, pins 2, 11, 45 refer to 'Ampheno' socket connexions and pins A2, B1, G13, to 'Mombo' plug connexions.

Note: In the following text the abbreviation l.p.c. will be used for 'Ampheno' socket or 'Mombo' plug as the case may be. Hence l.p.c 1 refers to the 50-pin connector No.1; etc.

TRANSISTORIZED DIGITAL PRINTER type TSA65.

1. Introduction.

The TSA65 has been designed to supply printed data, obtained from digital measuring equipment, of non-indicating, or temporary- indicating type, having up to eleven characters, each being defined by a twelve-line output and capable of supplying a specified voltage for each printable character.

2. Technical Summary.

2.1. Power Supply.

Mains: 205/225/245V 50 c/s.

Fusing: 1A, 2A and 0.6 Amp.

Consumption: 48 watts at 0.55 power factor.

2.2. Output.

Maximum Printing Capacity: 11 characters per line (optional).

Maximum Printing Rate: 5 lines per second.

Width of paper: 3 inches.

Standard Print Wheel Characters: 0,1,2,3,4,5,6,7,8,9, blank, hyphen or asterisk.

2.3. Ambient Temperature Range.

$0^{\circ}C$ to + $40^{\circ}C$.

2.4. Dimensions and Weight.

Height.	Width.	Depth.	Weight.
$11\frac{3}{4}$ ins. (29.8 cms)	$10\frac{1}{8}$ ins. (25.7 cms)	$16\frac{3}{4}$ ins (42.5cms)	$42\frac{1}{2}$ lbs. (19.2 kg).

3. Description of Equipment.

3.1. Equipment List.

The TSA65 consists of the following Venner plug-in stages, mounted and wired on to one of the two chassis:-

Trigger Amplifier type TS24.	1.
Multi-line Comparator type TS39	(up to) 11 (max.)

The Hewlett-Packard printer mechanism is mounted behind the front panel.

3.2. Mechanical Description.

The TSA65 is constructed in two parts, and housed within the carrying case. The printer mechanism slides in and out from the front, on runners, clear of the front casting, after two securing screws, one in each lower corner, have been removed. The two chassis carrying the electronic circuits may be withdrawn from the rear of the case by removing six securing screws, three along each edge of the rear panel.

The front panel is in three parts. The upper portion has the indicator light and a "POWER ON" switch in the left-hand corner, and the indicator light and a d.p.t.t. biased "RECORD" switch in the right-hand corner.

The central portion may be drawn forward and down, by the handle provided. The paper is fed out through a slit, serrated to facilitate tearing. On the left of this aperture is the "SPACE SELECTOR" control, and to the right, the "PAPER ADVANCE" control.

The lower portion has a drawer centrally placed, the front panel of which is hinged to allow the whole front, including the front panel of the drawer to be lowered flat and thus give access to the printer mechanism.

The rear panel has four connectors secured to it. The three pin mains plug PL4 is in the lower left-hand corner, when viewed from the rear. Three fifty-way connectors are mounted in-line across the rear panel. These connectors may be either of two types; 'Amphenol' or 'McMurdo' (see preface). Where 'Amphenol' type sockets are fitted section (i), below, should be read. Where 'McMurdo' plugs are fitted section (ii) applies.

(i) Amphenol sockets:

The three 50-pin sockets mounted in-line across the rear panel are numbered 1, 2 and 3 in order from left to right (i.e. when viewing the rear of the instrument)

Flying-plugs, for insertion in these sockets, are supplied for connecting the ancillary equipment to the TSA65. Each flying-plug is marked with the number of the socket with which it is to unite. It is important that these numbers be observed when constructing the inter-connecting cables for the ancillary equipment.

As the connectors are of a type having no facility for polarisation, it is possible to insert the plugs into the wrong sockets. Care must therefore be exercised, when connecting the instrument for operation, to ensure that each plug is inserted into the socket corresponding in connector number.

(ii) McMurdo plugs.

The three 50-pin plugs mounted in-line across the rear panel are numbered 1, 2 and 3. On the left is Plug 1 with a locating pin at the top and a locating dowel at the bottom. Plug 2 is in the centre and Plug 3 on its right. Both plugs 2 and 3 have locating

sockets at the top, and locating dowels at the bottom. This difference in locating pins and sockets eliminates the possibility of connecting the flying socket of plug 1 to plug 2 or 3.

Below connectors 1,2 and 3 are mounted two fuse holders. The holder to the left accepts a 1A 'mains' fuse (FS1) and that to the right accepts a 2A 'H.T.' fuse(FS2).

The rear panel may be removed by extracting the six screws, three along each side edge. Secured to the rear panel are two chassis, one above the other. Four free plugs connect the lines from the upper chassis to the printer. The left-hand connector when viewed from the rear, is a 25-way plug (PL5) and the three to the right of this (PL6, PL7 and PL8 in that order) are 50-way plugs.

The power supply for the unit is mounted on the lower chassis. This lower chassis can be separated from the chassis assembly by removing two screws from each side panel, near the lower edge. This provides greater accessibility to the underside of the upper chassis.

The left-hand half of the lower chassis, looking from the inside edge towards the rear panel, is occupied by the mains transformer. Centrally placed in line across the chassis towards the right edge are two 1125 microfarad electrolytic capacitors vertically mounted. Behind the right-hand electrolytic capacitor is the V15/20P (VT2) series stabiliser power transistor, whilst in front of it is the XP8 McMurdo plug. In front of the left-hand electrolytic capacitor is the preset potentiometer (VR1) for the adjustment of the stabilised H.T.voltage supply to the stages.

Mounted along the rear edge of the underside of the lower chassis is MR4, consisting of four GEX541 diodes which are bridge connected to form the full-wave rectifier of the H.T. power unit.

The remaining components are mounted on a tag-board across the chassis.

The upper chassis carries the twelve plug-in units mounted in two rows across its width, below a securing clamp. Looking at the top chassis, from the front edge to the rear panel, the first row of plug-in units are: on the left, one Trigger Amplifier type TS24, and to the right five Multi-Line Comparators type TS39. The rear row consists of six TS39's. The wheels to which these units are connected will be indicated later in the circuit description. To the left of the TS24 is the V15/20P (VT1) power transistor and near this the preset potentiometer (VR2) for the adjustment of the backing-off voltage.

3.3. Circuit Description.

3.3.1. Power Supply.

The mains connector, a Plessey Mark IV 3-pin socket (SK4), should have the following connexions made to it, when viewed from the rear of the socket:- top pin C, Earth; left-hand pin A, Live; right-hand pin B, Neutral. The mains 1 Amp fuse FS1 is in the Live lead from the input plug PL4 to pin 34 on the free plug PL5 (diagram ES32/88) from the upper chassis. The neutral pin is connected to pin 36 of plug PL5 and also pin 8 of the McMurdo XS8 socket SK9 (diagram ES32/88) also from the upper chassis. The connexion of pin C of PL4 is chassis earth and is taken to pin 1 of SK9, but this is NOT connected to H.T. positive.

The live line is connected from pin 34 of SK5 via PL5 to the "POWER ON" switch S13 (diagram ES32/89), and from there to the motor windings in the printer mechanism. The motor would therefore run whilst the "POWER ON" switch S13 was closed. A 0.6 Amp fuse FS1 is in the neutral return from the motor coils to pin 36 of SK5 (ES32/89). A further connexion is made from the "POWER ON" switch S13, back to pin 35 of socket SK5 (ES32/89), and via plug PL5 to pin 2 of socket SK9 (ES32/88). The live main is then connected via pin 2 of plug PL9 to the mains transformer T1 on the lower chassis.

Before switching the supply on, a check should be made that the mains tap is in the correct position. The mains tap positions are marked, on the underside of the lower chassis attached to the rear panel, 205V - 225V -245V, and are soldered terminations. The 115V tap should not be used unless provision has been made for the motor windings in the printer mechanism to be replaced, as they are normally 205/245V.

The secondary winding of the mains transformer T1 (diagram ES32/88) has two taps. The 15V connexion is taken to pin 4 of plug PL9, and via SK9 to the 2 Amp fuse FS2. From there it returns to pin 5 of SK9 and via PL9 to the junction of the bridge connected GEX541 diodes MR4. A further connexion from FS2 is made to pin 17 of plug PL5 and via SK5 to the "POWER ON" indicator lamp IL2. This lamp is connected across pin 16 and 17 of socket SK5 (diagram ES32/88) and is therefore across the 8V and 15V taps of the secondary winding of T1, and will be lit whilst the "POWER ON" switch S13 is closed.

The "RECORD" switch is a double-pole triple-throw biased switch S12 (diagram ES32/89), and normally rests in the central position for no printer operation i.e. printer off. In this position the printer mechanism is disengaged by the clutch coil L12 not being energised, though the motor continues to run whilst the "POWER ON" switch S13 is made. When the "RECORD" switch S12 is pressed upwards it remains there, and the clutch coil operates the clutch plate whenever the print cycle commences.

An indicator bulb IL1 is connected across the 8V and 15V taps of the secondary winding of T1, via pin 16 and 17 of socket SK5 (ES32/89), and remains lit whilst the "RECORD" switch is in the upwards or "AUTO" position.

Whenever "MANUAL" operation of the printer is required, the "RECORD" switch S12 must be held downwards, against the bias spring. This disconnects the indicator lamp IL1, and short circuits the resistor R3 (diagram ES32/89) in series with the clutch coil. The clutch coil now has the H.T. voltage (H.T. negative pin 14 of SK5 and PL5, via the cam relay - and H.T. positive pin 31 of SK5 and PL5) across it. This causes the printer to operate, and it continues to operate whilst the "RECORD" switch S12 is held down.

The 15V secondary winding tap of the mains transformer T1 is connected via SK9 and PL9 and the fuse FS2, to the junction of the GEX541 diodes. The OV end of the secondary is connected to the other junction of the GEX541 diodes (diagram ES32/88). This bridge connected circuit is the full-wave rectifier supplying 10V d.c. H.T. to the electronic circuit of the TSA65. It employs a series power transistor VT2, as the stabilising element. This is controlled by a d.c. amplifier using a Zener diode MR1 as the reference source. A proportion of the output

voltage is compared with the voltage developed across the Zener diode MR1, the difference in voltage being amplified and fed back to the series power transistor VT2 to off-set the difference between the Zener diode MR1 and the stepped down voltage output. The output voltage control is a preset potentiometer VR1(diagram ES32/88) and is situated near the McMurdo XP8 plug PL9 on the lower chassis. This may be adjusted after loosening the screw of the locking device secured to the spindle of the preset control. A voltmeter should be connected between H.T. positive, i.e. pin 45 (C13) of f.p.c.1 with socket SK1 removed, and H.T. negative, i.e. pin 46 (D8) also of f.p.c.1. The control should be set to an output voltage reading of 10 volts, and the spindle again locked by tightening the screw of the locking device. This voltage adjustment is made before despatch and should only need checking periodically.

The H.T. leads from pins 3 and 7 of socket SK9 are connected across a preset potentiometer VR2, secured to the upper chassis, and the centre variable arm is earthed. This is the only electrical d.c. earth and therefore H.T. positive and negative will vary about earth. If the wiper is turned down to the H.T. positive end of the control the H.T. negative will be 10 volts negative w.r.t. earth. If the wiper arm is turned up to the H.T. negative end, then H.T. positive will be 10 volts positive w.r.t. earth. Therefore, the Multi-line Comparators type TS39 will be influenced, so far as the signal input is concerned, by the position in which the preset control VR2 is set. This is important, and is known as the 'backing-off' voltage setting. It will be dealt with more fully in Section 3.3.2.

3.3.2. Backing-off Voltage.

The backing-off voltage control provides adjustment of the working range over which the input signals to the equipment may be varied. This is necessary where the d.c. levels of signals, from the equipment with which the printer is to be operated, are not in the normal working range of the printer. It is possible to operate the printer with a signal level which may lie anywhere between + 5 volts to "NOT PRINT" and + 3 volts to "PRINT", and -4 volts to "NOT PRINT" and - 6 volts to " PRINT".

This "PRINT" and "NOT PRINT" level is adjusted by the preset control VR2. The actual backing-off voltage must first be determined from the signal levels with reference to the graph Fig.1. To set up the correct backing-off voltage, remove socket 1, and connect a voltmeter on the 0-10V range across, positive to pin 45 (C13) and negative to pin 48 (D9) of f.p.c.1, at the rear of the printer. The preset control must then be adjusted to the voltage required for that particular signal level.

Example:- Suppose the input signal to the printer varied between 0 volts and + 4 volts. Reference to the graph Fig.1. shows that following the horizontal lines to the left from "Input Volts" 4 and 0, they straddle the "NEUTRAL ZONE" equally, above and below, at - 7 volts backing-off voltage. This then is the voltage to which the preset control must be set.

3.3.3. Printer.

The TSA65 is capable of printing up to 11 characters simultaneously per line at a maximum rate of 5 lines per second. One Multi-Line Comparator type TS39 is required for every digit to be printed; the twelfth stage is a Trigger Amplifier type TS24 which translates the

incoming print command pulse into print action. All sockets are wired before despatch. The Mechanical Details of the Printer are given in the Instruction Book issued by the Hewlett-Packard Company (Printer Model No. H05 -565A).

The TSA65 is normally wired to operate on signal levels shown in Fig.1. and mentioned in Section 3.3.2. If, however, the associated equipment has an output of reverse levels, i.e. the 'print' and 'not print' regions are reversed, the following changes will need to be made. The links between pins 2 and 4, and between 5 and 8 on the TS39 sockets must be disconnected, and then links remade between pins 2 and 5, and between pins 4 and 8 and the resistors R1 to 11 must be changed to 100 kilohms and connected to HT - VE.

3.3.4. Command to Print.

When the output of the equipment with which the TSA65 is associated is at its final level, the data will need to be printed to provide a more permanent record. A pulse must therefore originate from the associated equipment to cause the TSA65 to print. This is called the "Command to Print" pulse.

This "Command to Print" pulse which may be positive or negative, must be brought to pin 49(D10) and 47 (D11) respectively of f.p.c.1. The pulse is then passed via a screened lead to pin 6 or 4 respectively, at the input to the Trigger Amplifier type TS24. The minimum pulse amplitude is 2V positive or negative, and the minimum width is 10 microseconds. If working from the trailing edge of the pulse, the minimum pulse width will be 5 milliseconds.

When the "Command to Print" pulse triggers the TS24, the chassis mounted clutch drive transistor, base connected to output pin 1, becomes bottomed for 100 milliseconds

and current flows through the clutch coil. The energised coil releases the clutch pin and the clutch plate starts to revolve. A cam on the shaft opens a pair of N/C contacts which are in series with the clutch coil and H.T. negative. The 100 milliseconds pulse width is therefore broken soon after the wheel starts to turn. The clutch pin falls back against the clutch plate, in less than half a revolution, ready to engage and stop rotation.

3.3.5. Input impedance of Command to Print.

The input impedance to the print command circuit is greater than 50 kilohms for pulses up to 5V amplitude.

If the print command circuit is fed from a relay output, an external d.c. path of not more than 50 kilohms must be provided.

To reduce the possibility of stray pulses triggering the print command circuit, it is recommended that the leads are screened, unless fed from a low impedance, and any unused print command input earthed.

The connexion from Pin 49 (D10) (positive print command signal lead) of f.p.c.1 to pin 6 of the TS24 is already screened, and similarly,the negative print command signal input lead from pin 47 (D11) of f.p.c.1 to pin 4 of the TS24. The connexions from the output of the associated equipment to the printer are via pin 49 (D10) (positive print command signal) of f.p.c.1 at the rear, and pin 47 (D11) (negative print command signal) also of f.p.c.1.

3.3.6. Multi-Line Comparators in Use.

All eleven input lines to the input pin 6 of each TS39 are taken to the wiper arm on the print wheel switches. The line for each character on the print wheel is connected via sockets 6,7 and 8 to Plug 1,2 and 3 at the rear of the printer. The input line connexions for each printer wheel are tabulated at the back of this book, or the diagram ES32/90 indicates the connexions only, without the wheel number to which the inputs are taken. Plug 1, 2 and 3 accept all input lines (except mains).

To provide the facility of operating the TSA65 from more than one source simultaneously, the 47 kilohm resistors, connected to each input line are not terminated at the same point.

The input resistors to wheels 1 to 5 inclusive are commoned and taken to pin 41 (D1) of f.p.c.1 and the input resistors to wheels 6 to 11 inclusive are commoned and taken to pin 42 (D2) of f.p.c.1.

The input pin 6 of each TS39 is connected directly to the base of a transistor, and the type of output from the associated equipment will govern the eventual termination of the 47 kilohm resistors.

(a) Where the associated equipment has relay output, i.e. all relay contacts are N/O, except the contactrequired to pass on a print character voltage, all input resistors should be terminated at H.T. positive; pin 45 (C13) of f.p.c.1 should be connected to pin 41 (D1) and/or Pin 42 (D2) of f.p.c.1.

(b) Where all input lines carry a similar d.c. potential except for the one required "to print", the input resistors are to be connected to H.T. negative, i.e. Pin 46 (D8) of f.p.c.1 should be connected to pin 41 (D1) and/or Pin 42 (D2) of f.p.c.1.

3.3.7. Multi-Line Comparators Not in Use.

The TS39's not in use must similarly have some termination for the 47 kilohm resistors connected to the input transistors. They will, of course, have to have the same termination as any other TS39 within the commoned batch. Since there are two commoned batches, one of six inputs and the other of five, they may both have different terminations; one batch may go to H.T. positive pin 45 (C13),and the other to H.T. negative pin 46 (D8); or the same termination, both to H.T. positive pin 45 (C13), or both to H.T. negative pin 46 (D8), dependent entirely on the type of output from the associated equipment.

Where the input resistors have been taken to H.T. positive pin 45 (C13) 'blank' line of each unused input must be taken to H.T. negative pin 46 (D8), or the unused wheel will repeatedly print any of the twelve characters.

Where the input resistors have been taken to H.T. negative pin 46 (D8), the unused wheels should be set manually to 'blank' print position.

When more than one source of input to the printer is used, the 'Command to Print' must not be given until all input signals are at their final level.

Any TS39 socket positions without TS39's fitted should have the associated print wheel turned manually to print 'blank'.

3.3.8. Hold Signal.

The "hold signal" from pin 50 (D12) of f.p.c.1 may be used to stop the printer information sources, during the print cycle.

The trailing edge of this signal may be used to start the printer information sources immediately after the print cycle has been completed. This will allow the system to run at its maximum rate.

The hold signal amplitude is 9V, and the hold signal circuit has an output impedance of less than 1 kilohm. The actual levels depend upon the 'print' and 'not print' levels; the hold signal swinging from 4V negative of the 'print' level to 3V positive of the 'not print' level.

3.3.9. Input impedance of Information Lines.

The input impedance of the information lines to the printer will be 47 kilohms except for the lines corresponding to the print wheel positions. These lines will have an input impedance of not less than 22 kilohms with input voltages of less than 9V with respect to H.T. + V.E.

4. Installation Procedure.

4.1. Connexions.

The six screws holding the rear panel in position must be removed to obtain a view of the underside of the lower of the two chassis secured to the rear panel. The mains tap here must be checked and changed if the present tag to which it is soldered is not at the correct voltage working required.

The Mains socket must be connected as shown in diagram ES32/88, and as stated in Section 3.3.1.

The input lines must be connected to the 50-pin connectors 1,2 and 3. The connexions are tabulated at the back of the book, but see note 4.1.2. for 'Wheels'.

The TSA65 is normally supplied with TS39's fitted in socket positions for wheels 1,2 and 3 etc., Should these not be in the required positions, they must be inserted in

the TS39 socket position relating to the wheels required to 'print'. See further notes in Section 3.3.7., 4.1.3., and 4.1.4.for unused sockets, unused TS39's, and certain unused characters not required to 'print'.

4.1.1. TS39 Sockets.

The two rows of sockets across the upper chassis are associated with the wheels in this order:-

Looking over the rear panel, the extreme right hand socket of the second row from the rear panel is the TS24 socket, the next to the left is the first TS39 associated with wheel 1, and the third socket to the left associated with wheel 2 etc., to the sixth socket on the extreme left associated with wheel 5.

The extreme left-hand socket of the first row, i.e. the row nearest the rear panel, is associated with wheel 6, the next to the right with wheel 7 etc. to the extreme right-hand socket associated with wheel 11.

The extreme right-hand socket of the second row from the rear panel i.e. the TS24 socket, will always be occupied by a Trigger Amplifier type TS24, no matter what number of TS39's are used, or which positions are used for the TS39's.

4.1.2. Wheels (Numbers).

The print wheels are numbered, for wiring purposes, from the right to the left, when looking at the front panel. This is particularly important to remember when connecting input leads with reference to "PLUG CONNEXIONS" sheet, e.g. 71, 395 would appear as such in print, but the 5 would be printed by wheel 1, the 9 by print wheel 2 etc.,

4.1.3. Digits not required on any used wheels.

Assuming certain of the twelve characters, including blank and hyphen or asterisk, are not required to be printed, then :-

(a) If input resistors are connected to H.T. positive, pin 45 (C13) of f.p.c.1 (see 3.3.6. and 3.3.7.) all input lines not required may be left unconnected.

(b) If input resistors are connected to H.T. negative, pin 46 (D8) of f.p.c.1 (see 3.3.6. and 3.3.7.), all input lines not required must be connected to H.T. positive (pin 45 (C13) of f.p.c.1,2 or 3).

4.1.4. Unused Wheels.

(a) When all the TS39 units are not fitted the unused print wheels may be moved manually to blank.

(b) Where a TS39 unit is fitted but only a blank is required to be printed, and the input resistors have been connected to H.T. negative the wheel must be moved manually to 'blank' position.

(c) Where a TS39 unit is fitted but only a blank is required to be printed, and the input resistors have been connected to H.T. positive, the 'blank' input lines must be connected to H.T. negative.

4.2. Input Resistors.

Input resistors are connected in two batches one of 60 and the other of 72. From socket 5 each input line from 19 to 23, and 24 to 29 inclusive is taken to the wiper arms of the print wheel switches numbered 1 to 5, and 6 to 11, respectively. The common end of the resistors to wheels 1 to5 is connected to pin 41 (D1) of f.p.c.1.,and the common end of the resistors to wheels 6 to 11 is connected to pin 42(D2) of f.p.c.1.

Pins 41 & 42 (D1 & D2) must be connected to H.T. positive or H.T. negative, dependent on the type of output from the associated digital measuring equipment (see Sections 3.3.6 and 3.3.7).

4.3. Command and Hold.

4.3.1. The Print Command Signal.

The 'print command' signal lead originating from the associated digital measuring equipment, must be connected to the appropriate input, pin 49(D10) or pin 47(D11) of f.p.c.l. It is recommended that the unused input pin 49(D10) or 47(D11) be earthed; pin 48 (D9) of f.p.c.l. (see Section 3.3.4).

4.3.2. The Hold Signal.

This facility is provided to synchronise the external equipment with the operation of the printer. This facility need not be used provided that all input voltages are within the 'print' or 'not print' regions for at least 210 milliseconds. If the "HOLD SIGNAL" is required, the connexion should be made from pin 50(D12) of f.p.c.l (see Section 3.3.8).

4.4. H.T. and Backing-off voltage.

4.4.1. H.T. Adjustment.

Check H.T. voltage between pin 45 (C13) positive (NOT earth), and pin 46 (D8) negative of f.p.c.l. This should be set at 10 volts. If it is not, then the six screws holding the rear panel must be removed and the preset potentiometer, on the lower chassis, adjusted after loosening the locking device. (As described in para.8 of Section 3.3.1.)

4.4.2. Backing-off Voltage adjustment.

The backing-off voltage adjustment should be checked with a voltmeter across pin 45 (C13), H.T. positive, and pin 48(D9), each of f.p.c.l. The backing-off voltage may be adjusted by the preset control secured to the upper chassis (see Section 3.3.2.).

4.5. Paper Advance and Space Selector.

4.5.1. Paper Advance.

Paper may be advanced manually by rotating the control on the front of the printer. This is provided mainly for loading paper. A rod is supplied with the printer for use with a roll of paper, where folded paper is not used.

4.5.2. Space Selector.

Line spacing is adjusted by this control.

When set to '0' the manual paper advance control may be operated in reverse.

No printing will result by leaving this control in the '0' position.

4.6. Record.

4.6.1. Record "ON"

When the TSA65 has been installed, the operation of Mains "ON" and Record "ON" switches will bring the printer into service. (See paras.5 and 7 Section 3.3.1.).

4.6.2. Manual Record.

Depression of the Record switch will cause continuous printing of the input information, from the associated equipment.

This facility has been provided where manual operation of the printer is required.

METER TYPE
TSA 65
BACKING-OFF VOLTAGE

	M.E.C.	53127
CHKD		
DATE	9 SEP	

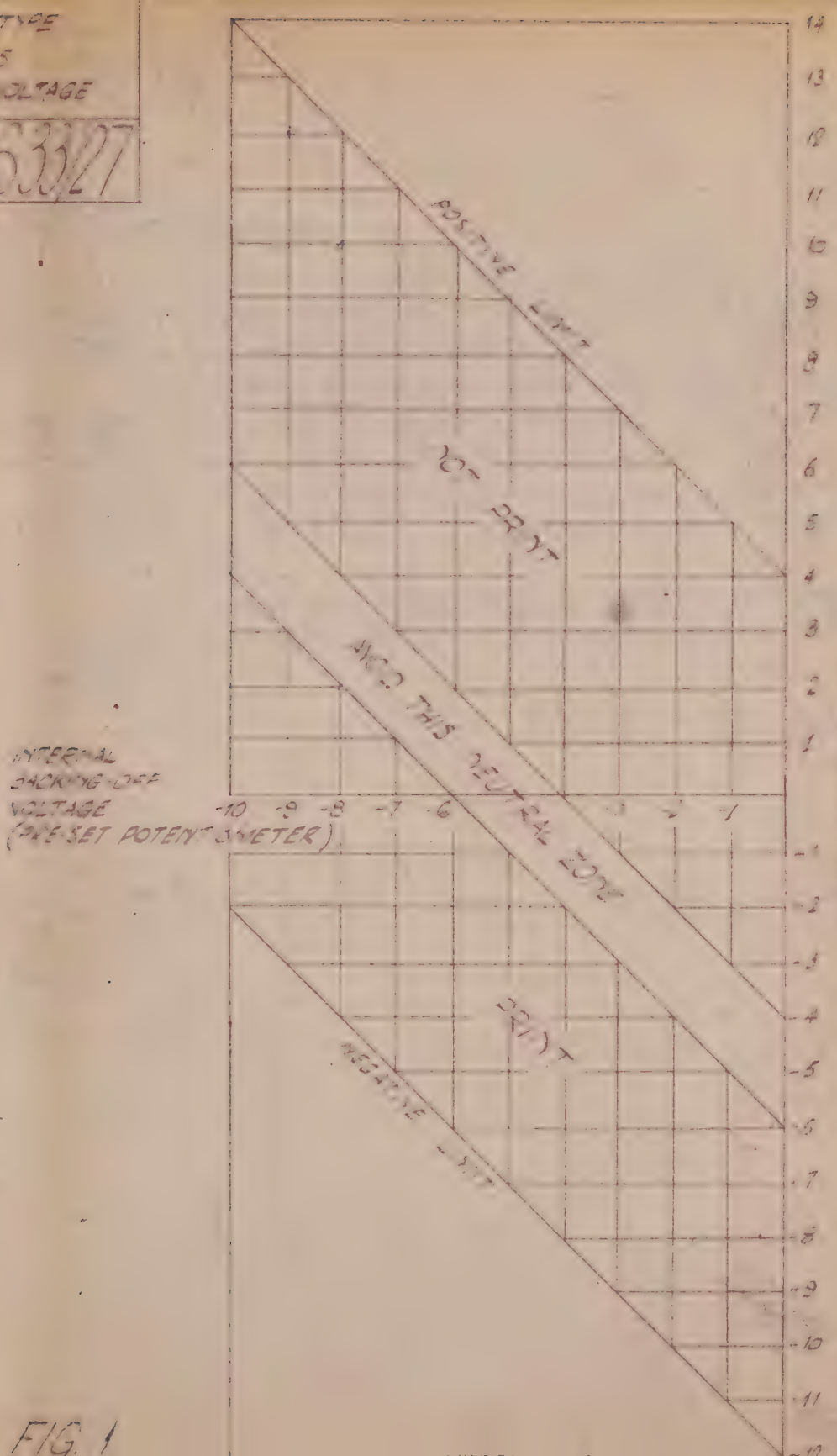

POSITIVE LIMIT
OUT OF SPEC
AND THIS NEUTRAL ZONE
OUT OF SPEC
NEGATIVE LIMIT
INTERNAL BACKING-OFF VOLTAGE (PRE-SET POTENTIOMETER)
-10 -9 -8 -7 -6 -3 -2 -1
14 13 12 11 10 9 8 7 6 5 4 3 2 1 -1 -2 -3 -4 -5 -6 -7 -8 -9 -10 -11 -12
OUTPUT VOLTAGE

FIG. 1

PRECAUTIONARY NOTES.

No current in excess of 1 mA must be allowed to flow into any input line or lines, whilst the mains supply to the TSA65 is switched off.

Care must be taken to ensure that dust or foreign bodies do not enter the printer mechanism. Enough stress cannot be laid upon the extreme importance of this precaution as the efficiency of the printer, and therefore, its accuracy, can be impaired by foreign matter entering the mechanism.

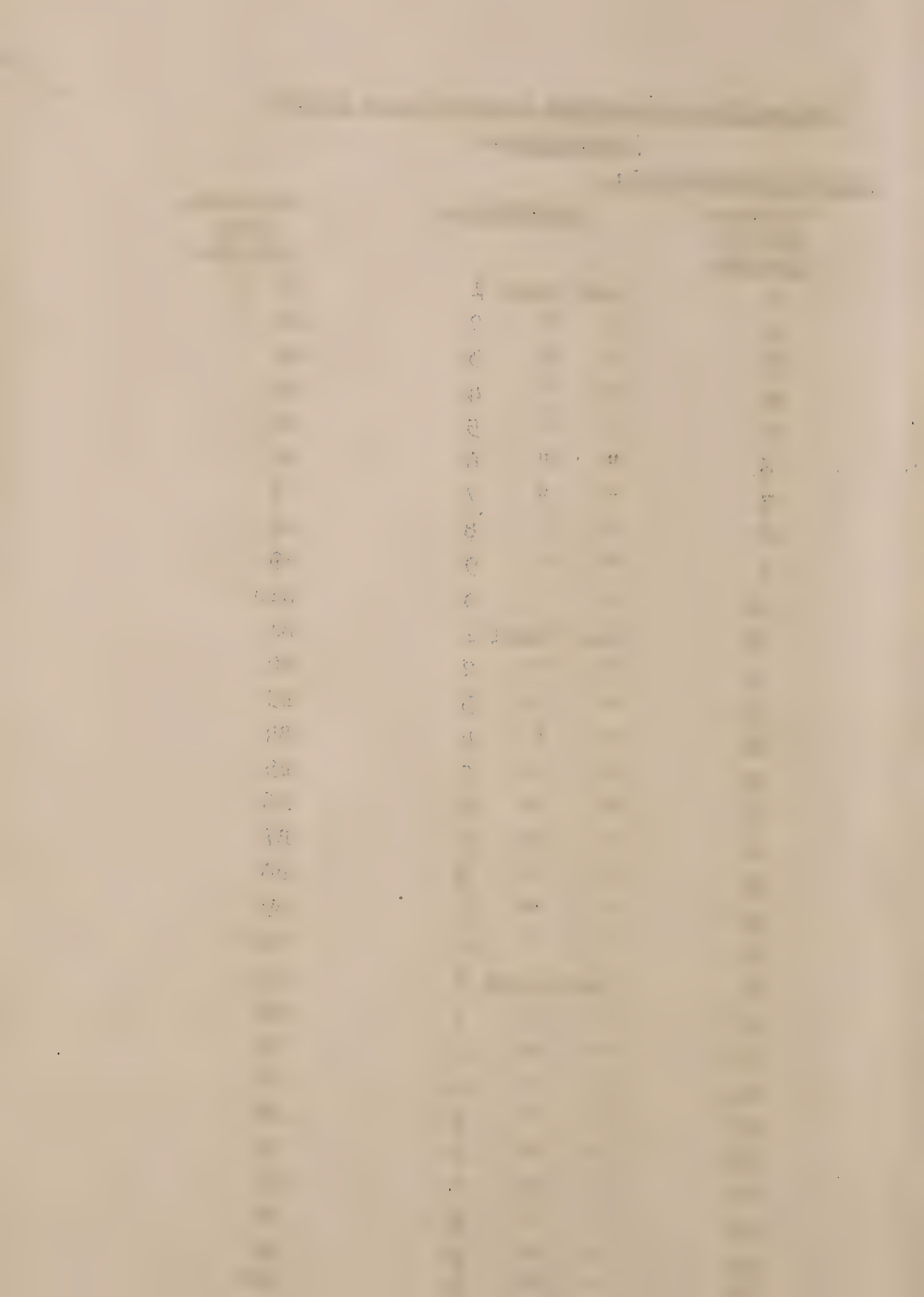
For servicing-information on the printer mechanism, reference should be made to the Hewlett-Packard service manual.

Venner Transistorized Printer type TSA65.

Connexions.

50-pin Connector 1:

'Amphenol' socket Pin No.	Connexion.	McMurdo. plug Pin No.
1	1st Wheel 1	A1
2	" " 2	A2
3	" " 3	A3
4	" " 4	A4
5	" " 5	A5
6	" " 6	A6
7	" " 7	A7
8	" " 8	A8
9	" " 9	A9
10	" " 0	A10
11	2nd Wheel 1	B1
12	" " 2	B2
13	" " 3	B3
14	" " 4	B4
15	" " 5	B5
16	" " 6	B6
17	" " 7	B7
18	" " 8	B8
19	" " 9	B9
20	" " 0	B10
21	3rd Wheel 1	C1.
22	" " 2	C2
23	" " 3	C3
24	" " 4	C4
25	" " 5	C5
26	" " 6	C6
27	" " 7	C7
28	" " 8	C8
29	" " 9	C9
30	" " 0	C10



(Plug 1 continued)

'Amphenol' socket Pin No.	Connexion.	'McMurdo' plug Pin No.
31	1st Wheel ⁂	A11
32	2nd Wheel ⁂	B11
33	3rd Wheel ⁂	C11
34	-	-
35	-	-
36	-	-
37	1st Wheel Blank	A12
38	2nd " "	B12
39	3rd " "	C12
40	-	-
⁂ (41	Wheels 1-5 input resistors	D1
(42	Wheels 6-11 " "	D2
43	-	-
44	-	-
45	H.T. + VE	C13
46	H.T. - VE	D8
47	Print Command -VE	D11
48	Earth	D9
49	Print Command + VE	D10
50	Hold Signal	D12

Note:

The 50-pin connectors are numbered 1 to 3 from left to right as viewed from the rear of the instrument.

⁂ Sign or Asterisk printed for this connexion according to type of printer wheel fitted.

⁂ When 10-line inputs are obtained from Venner instruments, the input resistors should be connected to H.T.-VE. For other cases refer to Section 3.3.6. (a) and (b).

50-pin Connector 2:

'Amphenol' socket Pin No.	Connexion.	'McMurdo' plug Pin No.
1	4th Wheel 1	A1
2	" " 2	A2
3	" " 3	A3
4	" " 4	A4
5	" " 5	A5
6	" " 6	A6
7	" " 7	A7
8	" " 8	A8
9	" " 9	A9
10	" " 0	A10
11	5th Wheel 1	B1
12	" " 2	B2
13	" " 3	B3
14	" " 4	B4
15	" " 5	B5
16	" " 6	B6
17	" " 7	B7
18	" " 8	B8
19	" " 9	B9
20	" " 0	B10
21	6th Wheel 1	C1
22	" " 2	C2
23	" " 3	C3
24	" " 4	C4
25	" " 5	C5
26	" " 6	C6
27	" " 7	C7
28	" " 8	C8
29	" " 9	C9
30	" " 0	C10,

50-pin Connector 2:(Cont'd).

'Amphenol' socket Pin No.	Connexion.	'McMurdo' plug Pin No.
31	7th Wheel 1	D1.
32	" " 2	D2.
33	" " 3	D3.
34	" " 4	D4
35	" " 5	D5
36	" " 6	D6
37	" " 7	D7
38	" " 8	D8
39	" " 9	D9
40	" " 0	D10
41	4th Wheel ⌀	A11
42	5th " ⌀	B11
43	6th " ⌀	C11
44	7th " ⌀	D11
45	H.T. +VE	C13
46	H.T. -VE	-
47	4th Wheel Blank	A12
48	5th " "	B12
49	6th " "	C12
50	7th " "	D12

⌀. See note '⌀' on page 21.

50-pin Connector 3:

'Amphenol' socket Pin No.	Connexion.	'McMurdo' plug Pin No.
1	8th Wheel 1	A1
2	" " 2	A2
3	" " 3	A3
4	" " 4	A4
5	" " 5	A5
6	" " 6	A6
7	" " 7	A7
8	" " 8	A8
9	" " 9	A9
10	" " 0	A10
11	9th Wheel 1	B1
12	" " 2	B2
13	" " 3	B3
14	" " 4	B4
15	" " 5	B5
16	" " 6	B6
17	" " 7	B7
18	" " 8	B8
19	" " 9	B9
20	" " 0	B10

50-pin Connector 3: (Continued).

'Amphenol' socket Pin No.	Connexion.	'McMurdo' plug Pin No.
21	10th Wheel 1	C1
22	" " 2	C2
23	" " 3	C3
24	" " 4	C4
25	" " 5	C5
26	" " 6	C6
27	" " 7	C7
28	" " 8	C8
29	" " 9	C9
30	" " 0	C10
31	11th Wheel 1	D1
32	" " 2	D2
33	" " 3	D3
34	" " 4	D4
35	" " 5	D5
36	" " 6	D6
37	" " 7	D7
38	" " 8	D8
39	" " 9	D9
40	" " 0	D10
41	8th Wheel Ø	A11
42	9th " Ø	B11
43	10th " Ø	C11
44	11th " Ø	D11
45	H.T. + VE	C13
46	H.T. - VE	-
47	8th Wheel Blank	A12
48	9th " "	B12
49	10th " "	C12
50	11th " "	D12

Note: Connector 1, when of the McMurdo type (i.e.a plug), has the locating dowel at the high pin-number end.

Mains Input Plug. (PL4)

Pin : A. Mains Live

Pin : B. Mains Neutral

Pin : C. Earth.

For Circuit Reference see following page.

DIGITAL PRINTER TYPE TSA65.

Circuit reference (Diagram ES32/88)

Resistors.

R1 - 11	330 kilohms.
R12	100 ohms
R13	1.8 kilohms
R14	100 ohms
R15	780 ohms
R16	22 kilohm
R17	100 ohms
R18	820 ohms
R19	10 ohms
VR1,VR2	1 kilohm

Capacitors.

C1, C6	1125 microFarad
C2, 7	100 microFarad
C3	1 microFarad
C4	4 microFarad
C5	100 microFarad

Rectifiers.

MR1	SX56
MR2, MR3	GEX34.
MR4	Four GEX541.

Transistors.

VT1	V15/20P
VT2	V15/20P
VT3	GET115.
VT4	OC71.

Fuses.

FS1	1 Amp Mains.
FS2	2 Amp H.T.

Transformers.

T1	Mains Transformer

Circuit Reference (Diagram ES32/89).

Resistors.

R1	120 ohms. Mounted on the Printer Mechanism.
R2	10 kilohms. Mounted on the Printer mechanism.
R3	1 kilohm. Mounted on the Printer mechanism.
R4- 136	47 kilohms. Mounted on the Printer mechanism.

Capacitors.

C1	0.22 microFarad.
C2	2 microFarad.

Switches.

S1- S11	Print wheel switches.
S12	"RECORD ON" switch.
S14	"POWER ON" switch.

Rectifiers.

MR1	GEX541

Indicator Lamps.

IL1	8V 0.15 Amp.
IL2	8V 0.15 Amp.

Circuit Reference (Diagram ES32/89) Cont'd..

Coils.

L1 - L11	Print wheel Solenoids.	Fuses.	
L12	Clutch coil.	FS1	0.6 Amp.
L13 -L14	Motor Windings.		

ON TS 39 BASES SHORT PINS 2 TO 4 AND 5 TO 8

TS 39 (×11)

TS 24

R1 R2 R3 R4 R5 R6 R7 R8 R9 R10 R11

R19 10Ω

C7 100 μF

HT -Ve

SCREENED

VT1 VIS/20

R12

PLUG	SOCKET
MCMURDO/AMPHENOL	
C13	45
D1	41
D2	42
D8	46
D9	48
D10	49
D11	47
D12	50
C13	45
C13	45

50 PIN CONNECTOR No

PLUG 5

PL8 PIN 39

PL8 PIN 38

PIN 3 ON ALL PLUG IN STAGES EXCEPT TS 24

PIN 7 ON ALL PLUG IN STAGES

VR3 backing-off voltage

MR2 MR3 MR4 MR1

VT2 VT3 VT4

GET 115

R13 R14 R15 R16 R17 R18

C1 C2 C3 C4 C5 C6

GEX 681

25V CE 1214/1

VR1 1K

820Ω 10%

245 225 205

FS2

PL4 A B C

CIRCUIT DIAGRAM FOR PRINTER TYPE TSA 65.

C/N No	DATE	ISSUE	C/N No	DATE	ISSUE
6973	18 12 62	F	6559	18 4 61	C
6927	25 10 62	E	6437	28 9 60	B
6918	18 5 62	D	6355	13 3 60	A

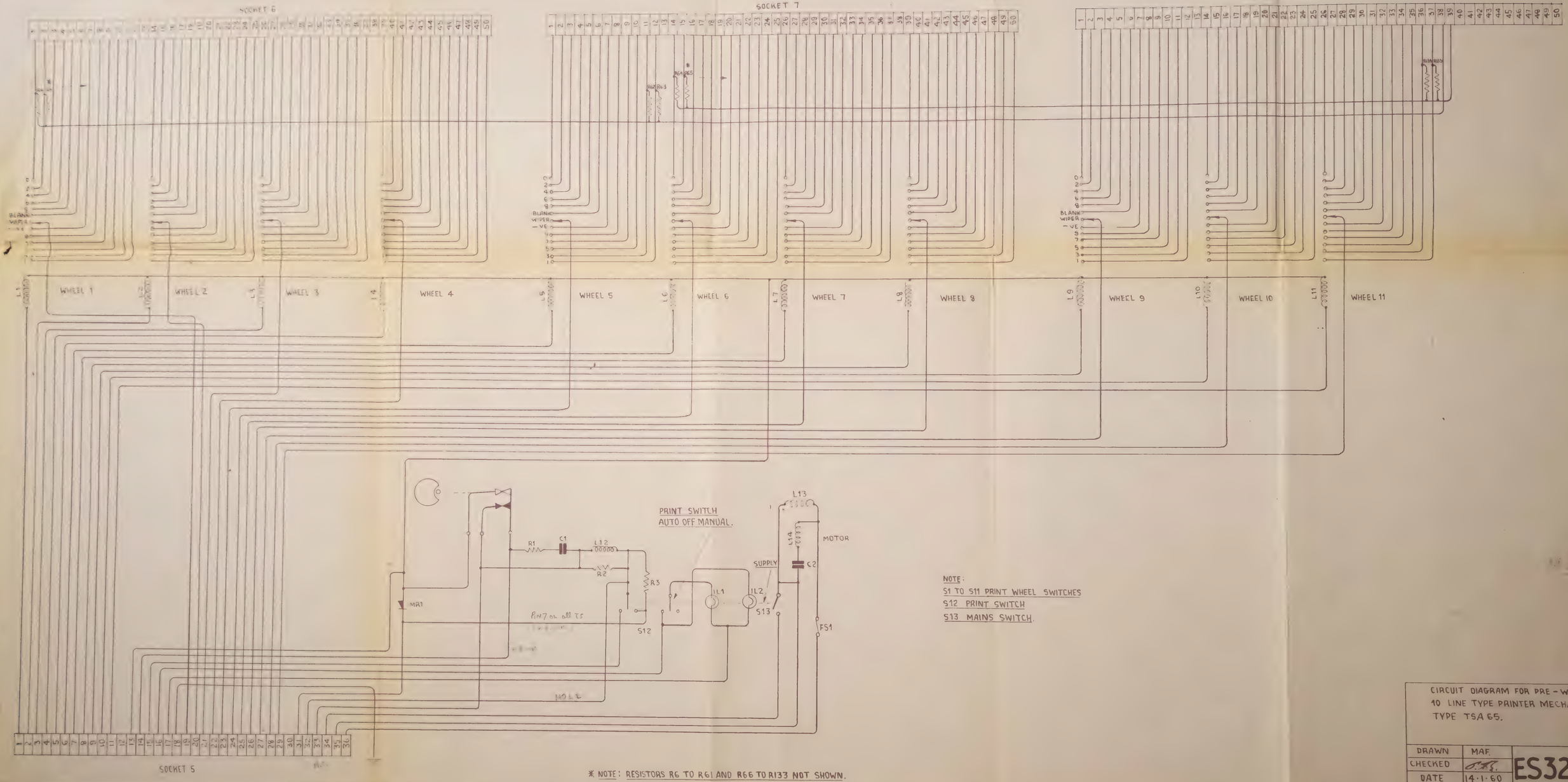
DRAWN M.A.F.

CHECKED

DATE 15 1 60

ES 32/88.

VENNER ELECTRONICS LTD.



NOTE:
S1 TO S11 PRINT WHEEL SWITCHES
S12 PRINT SWITCH
S13 MAINS SWITCH.

* NOTE: RESISTORS R6 TO R61 AND R66 TO R133 NOT SHOWN.

CIRCUIT DIAGRAM FOR PRE-WIRED
10 LINE TYPE PRINTER MECHANISM
TYPE TSA 65.

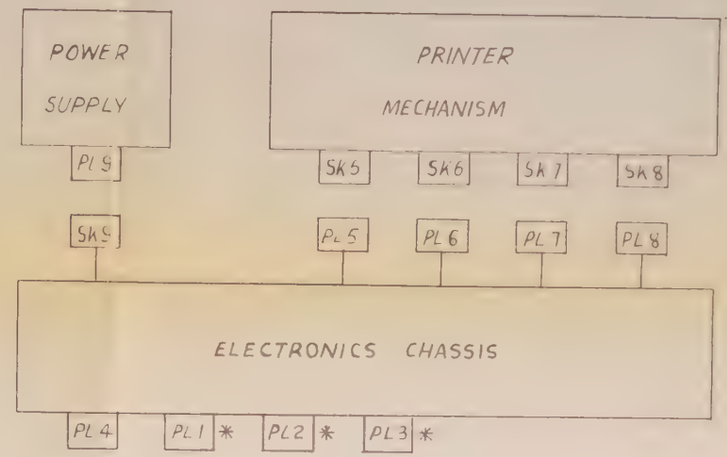
DRAWN	MAF.	ES32/89
CHECKED		
DATE	14·1·60	

VENNER ELECTRONICS LIMITED.

50 PIN CONNECTOR 1			
Mc MURDO PLUG PIN Nº	PLUG OR SOCKET	PIN No.	AMPHENOL SOCKET PIN Nº
A 1	PLUG 6	12	1
A 2	"	2	2
A 3	"	11	3
A 4	"	3	4
A 5	"	10	5
A 6	"	4	6
A 7	"	9	7
A 8	"	5	8
A 9	"	8	9
A 10	"	1	10
A 11	"	7	31
A 12	"	6	37
A 13	"		
B 1	"	25	11
B 2	"	15	12
B 3	"	24	13
B 4	"	16	14
B 5	"	23	15
B 6	"	17	16
B 7	"	22	17
B 8	"	18	18
B 9	"	21	19
B 10	"	14	20
B 11	"	20	32
B 12	"	19	38
C 1	"	37	21
C 2	"	27	22
C 3	"	36	23
C 4	"	28	24
C 5	"	35	25
C 6	"	29	26
C 7	"	34	27
C 8	"	30	28
C 9	"	33	29
C 10	"	26	30
C 11	"	32	33
C 12	"	31	39
C 13	CIRC.		45
D 1	"		41
D 2	"		42
D 3			
D 4			
D 5			
D 6			
D 7			
D 8	CIRC.		46
D 9	"		48
D 10	"		49
D 11	"		47
D 12	SOCKET 5	32	50

50 PIN CONNECTOR 2			
Mc MURDO PLUG PIN Nº	PLUG OR SOCKET	PIN Nº	AMPHENOL SOCKET PIN Nº
A 1	PLUG 6	50	1
A 2	"	40	2
A 3	"	49	3
A 4	"	41	4
A 5	"	48	5
A 6	"	42	6
A 7	"	47	7
A 8	"	43	8
A 9	"	46	9
A 10	"	39	10
A 11	"	45	41
A 12	"	44	47
A 13			
B 1	PLUG 7	12	11
B 2	"	2	12
B 3	"	11	13
B 4	"	3	14
B 5	"	10	15
B 6	"	4	16
B 7	"	9	17
B 8	"	5	18
B 9	"	8	19
B 10	"	1	20
B 11	"	7	42
B 12	"	6	48
C 1	"	25	21
C 2	"	15	22
C 3	"	24	23
C 4	"	16	24
C 5	"	23	25
C 6	"	17	26
C 7	"	22	27
C 8	"	18	28
C 9	"	21	29
C 10	"	14	30
C 11	"	20	43
C 12	"	19	49
C 13	CIRC.		45
D 1	PLUG 7	37	31
D 2	"	27	32
D 3	"	36	33
D 4	"	28	34
D 5	"	35	35
D 6	"	25	36
D 7	"	34	37
D 8	"	30	38
D 9	"	33	39
D 10	"	26	40
D 11	"	32	44
D 12	"	31	50

50 PIN CONNECTOR 3			
Mc MURDO PLUG PIN Nº	PLUG OR SOCKET	PIN Nº	AMPHENOL SOCKET PIN Nº
A 1	PLUG 6	50	1
A 2	"	40	2
A 3	"	49	3
A 4	"	41	4
A 5	"	48	5
A 6	"	42	6
A 7	"	47	7
A 8	"	43	8
A 9	"	46	9
A 10	"	39	10
A 11	"	45	41
A 12	"	44	47
A 13			
B 1	PLUG 8	12	11
B 2	"	2	12
B 3	"	11	13
B 4	"	3	14
B 5	"	10	15
B 6	"	4	16
B 7	"	9	17
B 8	"	5	18
B 9	"	8	19
B 10	"	1	20
B 11	"	7	42
B 12	"	6	48
C 1	"	25	21
C 2	"	15	22
C 3	"	24	23
C 4	"	16	24
C 5	"	23	25
C 6	"	17	26
C 7	"	22	27
C 8	"	18	28
C 9	"	21	29
C 10	"	14	30
C 11	"	20	43
C 12	"	19	49
C 13	CIRC		45
D 1	PLUG 8	37	31
D 2	"	27	32
D 3	"	36	33
D 4	"	28	34
D 5	"	35	35
D 6	"	25	36
D 7	"	34	37
D 8	"	30	38
D 9	"	33	39
D 10	"	26	40
D 11	"	32	44
D 12	"	31	50



NOTE:-

CIRC. IN TABLE OF CONNECTIONS INDICATES WIRE TERMINATED. WITHIN CHASSIS.

* ON INSTRUMENTS FITTED WITH AMPHENOL CONNECTORS THESE ARE SKT 1, 2 & 3 RESPECTIVELY

INTERNAL CONNECTIONS OF MAIN SIGNAL LINES FOR PRINTER TYPE TSA 65

			DRAWN	
6927	25·10·62	B	CHECKED	A.P
6919	9-10-62	A	DATE	
C N/Nº	DATE	ISSUE	VENNER ELECTRONICS LTD.	

F532/90

TRANSISTORIZED TRIGGER
AMPLIFIER type TS24.

VINNER ELECTRONICS LIMITED,
Kingston By-Pass,
New Malden,
Surrey, England.

Telephone MALden 2442.

DRO/NLA/AP/PD/2/60.

Transistorised Trigger Amplifier type TS24.

The transistorised Trigger Amplifier type TS24 is designed to drive an external V15/20P power transistor, switching a 1 Amp (maximum) load.

A positive or negative-going input may be used to trigger the TS24. On receipt of a suitable pulse, amplification takes place and the pulse drives the trigger circuit. The output of the trigger circuit is inverted and fed via an emitter follower to the external transistor.

The current may be switched on with a minimum input of 2 volts positive or negative. The pulse width minimum is 10 microseconds, but if working on the trailing edge of the input pulse, the minimum will be 5 milliseconds.

Should the unit be triggered from relay contacts, the external leakage path provided must be 100 kilohms or less.

To reduce the possibility of stray pulses entering the circuit, it is recommended that the input leads be screened and the unused input earthed.

When used with the V15/20P, a 100 ohm external resistor should be connected between base and emitter.

SPECIFICATION:-

Supply voltage:	9V to 12V (10V nominal).
Input pulse width:	10 microsecond (minimum).
	Trailing edge 5 milliseconds (minimum).
Output pulse width:	100 milliseconds (approx.).

Drive voltage availiable (10V supply) 9V (open circuit).

Drive current available (10V supply): 100 mA (short circuit).

Input impedance: Greater than 50 Kilohms for input pulses up to 4V in amplitude.

Ambient temperature range: $-10^{\circ}C$ to $+50^{\circ}C$.

Dimensions: 2.75 ins. (70mm) x 1.656 ins (42 mm) x 0.781 ins (20 mm).

Finish : Unit is mounted in removable plastic case.

Connector: The XP8 plug mounted on the unit is intended for use with the socket type XS8, made by the McMurdo Instrument Company.

PIN CONNEXIONS:

Pin 1: Output (Base of Power transistor).

Pin 2: Not used.

Pin 3: H.T. negative.

Pin 4: Negative input (pulse).

Pin 5: Not used.

Pin 6: Positive input (pulse).

Pin 7: H.T. positive.

Pin 8: Not used.

Transistorized Multi-Line Comparator type TS39. Instructions.

VENNER ELECTRONICS LIMITED,
Kingston By-Pass,
New Malden, Surrey,
England.

Telephone MALden 2442

NLA/AP/PD/6/60.

Transistorised Multi-Line Comparator type TS39.

The Transistorised Multi-Line Comparator has been designed to energise an external load of not less than 100 ohms. The current may be switched ON to the load for input voltages between 0 and -4, and OFF for input voltages between -6 and -10; OR the current may be switched OFF from the load for input voltages between 0 and -4, and ON for input voltages between -6 and -10.

The TS39 is primarily designed for use as an electronic switching stage in an electronic printer, being connected between the print wheels and the operating solenoid mechanism.

Alternative external connexion is available at the McMurdo socket type XS8 to enable the printer to 'print' or 'not print' on positive or negative-going input signals.

Switching Voltage Connexions.

When pins 2 and 5 are connected together, and pins 4 and 8 are connected together the output current will be switched OFF for input voltages more positive than -4 volts, and switched ON for input voltages more negative than -6 volts.

When pins 2 and 4 are connected together, and pins 5 and 8 are connected together the output current will be switched OFF for input voltages more negative than -6 volts, and switched ON for input voltages more positive than -4 volts.

Input potentials between -4 volts and -6 volts should be avoided to ensure satisfactory operation.

Pin Connexions.

1. Output (to load).
2. Two functions.
   Connected to pin 4 the current to the load ON for positive signals. Connected to pin 5 the current to the load ON for negative signals.
3. H.T. negative 10 volts.
4. Connected to 2 or 8.
5. Connected to 2 or 8.
6. Input switching signal.
7. H.T. positive 10 volts.
8. Two functions.
   Connected to pin 5 the current to the load ON for positive signals. Connected to pin 4 the current to the load ON for negative signals.

SPECIFICATION.

Supply: 10 volts, to unit. Maximum D.C. via load, to output transistor at pin 1, 24 volts.
Maximum peak voltage to collector, on switching off inductive loads, 50 volts.

Consumption: 160 milliWatts (Excluding load).
1 watt load (not less than 100 ohms).

Input signal voltage limits: + 4 volts; -10 volts.

Input impedance: 50 kilohms minimum.

Output voltage: 10 volts.

Output current:	100 milliAmps.
Temperature range:	-10°C to + 50°C.
Dimensions:	2.75 in. x 1.656 in. x 0.781 in. (70 x 42 x 20 mm).
Weight:	2 ozs. (57 gms).
Finish:	The unit is mounted in removable plastic case.
Connector:	The plug mounted on the unit is intended for use with socket type XS8 made by the McMurdo Instrument Company.

Output current:	100 milliAmps.
Temperature range:	-10°C to + 50°C.
Dimensions:	2.75 in. x 1.65 in. x 0.781 in. (70 x 42 x 20 mm).
Weight:	2 ozs. (57 gms).
Finish:	The unit is mounted in removable plastic case.
Connector:	The plug mounted on the unit is intended for use with socket type 3N8 made by the Kolburdo Instrument Company

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